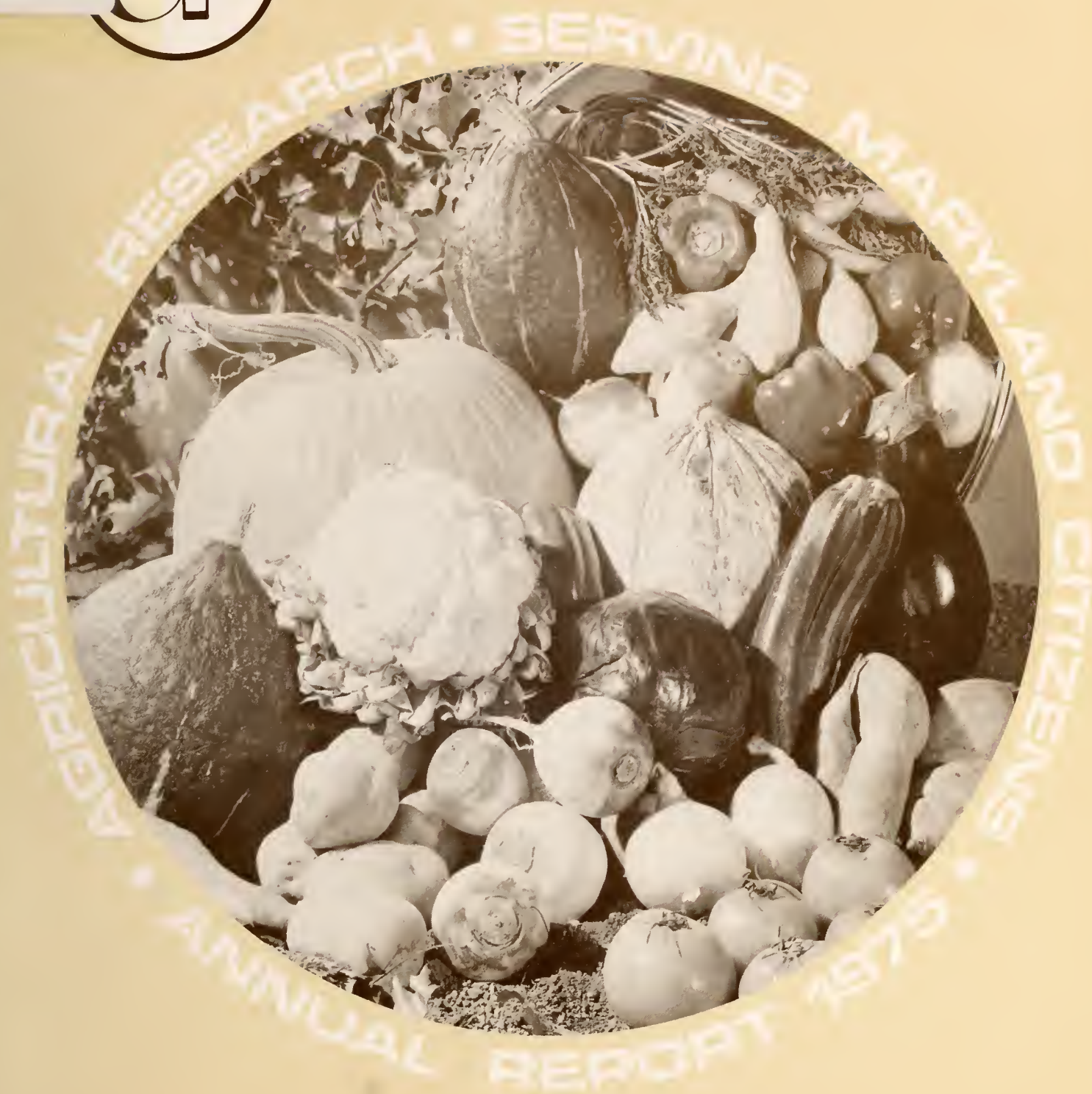


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AGRICULTURAL EXPERIMENT STATION

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INTRODUCTION

Two significant milestones will be reached this year, the 100th anniversary of the United States agricultural experiment stations and the birthday of the world's four billionth child.

Although the Maryland Agricultural Experiment Station was not officially named until 1888, it joins with those of all other states in celebrating the founding of the first agricultural experiment station in Connecticut in 1875. Our station also joins with all others in accepting the challenges exemplified by the birth of the world's four billionth child.

As agricultural scientists, we recognize as awesome the task of providing the raw materials necessary to feed, clothe and house the world's exploding population. At the same time, we realize that the agricultural sciences, because of their intimate involvement with food and fiber production, the conservation of natural resources, and the nutritional well-being of people, hold the key to successfully meeting these human needs.

By serving the people of the state, the Maryland Agricultural Experiment Station contributes importantly to these national and world needs. As our research is used by Maryland farmers, communities, businessmen and consumers, the interests of all the people are served. In addition, most of our scientific advances are not fenced in by state boundaries, but are applied by others here and abroad.

We are proud of our research achievements since 1888. Maryland's farmers are among the most productive and progressive in the nation. However, we are convinced that our greatest challenges and our greatest contributions lie ahead.

This report contains some research highlights of the Maryland Agricultural Experiment Station during the past year. We hope that these brief reports will give you a glimpse of what we are doing, and an insight of how the results of our efforts serve your needs, and those of mankind.

R. L. Green

Acting Director
Maryland Agricultural Experiment Station

Maryland Agricultural Experiment Station

Annual Report

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PLANT SCIENCES INCLUDING SOILS & PEST MANAGEMENT

Identifying Poisonous Plants

Caution! This plant may be harmful to your health!

Maryland has a number of native poisonous plants that are being added to the collection of the Maryland Herbarium on the University campus. As the collection grows, so does the breadth of service that scientists can provide to the public in plant identification. Additions of poisonous plants are of particular value to the medical profession and the public in making a quick emergency identification of a toxic plant that may cause death or serious illness.

Improving Crop Yields

The great advances in crop yields in Maryland have been through the introduction of new varieties developed by the Agricultural Experiment Station. Researchers are continually trying to isolate new qualities that can be bred into Maryland crops. Nineteen new and superior varieties of soybeans, tobacco and alfalfa have been released to growers in the past ten years. At present, approximately 90 percent of the tobacco and soybeans grown in the state are experiment station releases. An example of the impact of these new releases is the increased revenue from soybeans. In 1965, the Maryland soybean crop brought in 13 million dollars; in 1974, the figure climbed to 58.8 million dollars.

Eliminating Undesired Effects

Some of the fungicides that Maryland growers use to protect their plants from disease cause undesirable dwarfing effects. Scientists of the Maryland Agricultural Experiment Station have shown that if the fungicides are applied with small amounts of plant growth regulating chemicals called gibberellins these dwarfing tendencies are overcome.

Increasing Lima Bean Yields

For almost 30 years, the yield barrier for lima beans in this area has remained at about 1,300 pounds of shelled beans per acre. During that time period, the Maryland-Delaware region has been second only to California in production. Repeated tests by experiment station scientists have shown that yields can be increased by as much as 50 percent by planting the beans in 18-inch rows instead of the conventional 36-inch rows. With almost 20,000 acres of lima beans planted annually in this region, the returns to growers could run as high as 1.35 million dollars. There is only one catch. Harvesting equipment must be modified to handle beans in narrower rows. Work is being carried out by agricultural engineers to develop such equipment for local producers.

Studying Bizarre Peppers

Scientists have developed an unusual pepper that is making it possible to better understand the function of chromosomes and ultimately to help breed improved qualities into several economic crops.

Called haploid because it contains chromosomes only from the female parent, the research pepper can be cross-bred with normal peppers to produce plants with more than the usual number of chromosomes some of the time. Plants such as these are used to locate important genetic traits in other crops such as corn and tomatoes.

Protecting Maryland Forests

The growth of Maryland's loblolly pine trees can be retarded as much as 50 percent because of damage caused by the Nantucket pine tip moth. A recently completed four-year study of reforestation plantings in Southern Maryland and on the Eastern Shore revealed that two-year-old seedlings protected from tip moths grew 10 to 12 feet tall in four years. Unprotected trees grew to only half that height during the same time period.

In a related study dealing with tip moth populations, entomologists hope to find cultural and other control practices to reduce tip moth populations and accelerate the growth of loblolly pines in Maryland.



Research entomologist, Dr. Allen Steinhauer, measures pine seedlings to determine the effects pine tip moths have on their growth.



Johnsongrass, the number one weed pest in Maryland, can take over fields and cause serious losses to many crops.

Utilizing Sewage Sludge

Sewage sludge, once thought a complete waste product, can now be composted with wood chips and used in place of peat moss or pine bark. The sludge compost serves as organic matter and supplies many other nutrients for growing ornamental plants.

Sludge applied at rates of 50 to 100 tons per acre was shown to be adequate for one-year seedlings of dogwoods and tulip poplars in nursery beds. The sludge increased water holding capacity of sandy soils, as well as reducing soil acidity and reducing winter injury to tulip poplars.

Sewage sludge is also a good potting mix when combined with leaves, soil or sand. Because composted sewage sludge contains nutrients, only limited supplemental feeding appears necessary.

Growing Maryland Grapes

After four years of testing, agricultural scientists have developed a fungicide and pesticide program for Maryland grape growers. The program is effective against black rot, powdery and downy mildew, early season insects and Japanese beetles. The three-acre test plots used by the scientists produced 23 tons of grapes in 1974. The entomologists believe that grapes can be commercially grown in Maryland and may lead to the addition of another commodity for the state.

Reducing Seeding Rates

Commercial pea growers in the state became concerned when the price of pea seed jumped from 13 to 30 cents a pound in two years. They asked the Agricultural Experiment Station to see if there were any measures that could be taken to reduce the number of seeds planted per acre without harming yields. Researchers found that the seeding rates could be reduced. One large grower followed the reduced seeding rate and saved nearly 15 dollars per acre. If other processors have the same results, seed cost savings could amount to 75,000 dollars per year for the pea industry.

Combining Cereals and Soy

Science is proving that it is possible to have two crops grow where only one grew before. During three years of study, Maryland researchers planted sweet corn and soybeans in a single planting operation. Sweet corn yields were about the same as corn planted alone. The soybeans yielded 18 to 23 bushels per acre following the sweet corn harvest.

Normally, sweet corn fields lie idle after harvest, but by co-cropping, these fields will be put into full season productivity. If two-thirds of the 15,000 sweet corn acres are co-cropped and produce an average yield of 20 bushels of soybeans, the increased income will be one million dollars. The potential for additional income could push the sweet corn acreage figure even higher.

Controlling Johnsongrass

Johnsongrass is the number one weed pest in Maryland and causes considerable losses in crop yields each year. Research conducted by the Maryland Agricultural Experiment Station has shown that herbicide and cultural practices exist that will control the weed. Farmers are welcoming information on these new practices that will help them to greatly reduce crop losses due to johnsongrass.

New Fungicide For Vegetables

What Maryland vegetable gardener has never suffered the effects of powdery mildew on his squash, cucumbers or pumpkins? The common recommendation for control of the fungus has been the application of the fungicide benomyl. However, recent field studies by Maryland scientists have uncovered the presence of a strain of powdery mildew that is tolerant to benomyl. To combat this, the researchers tested a new fungicide, "Afugan", and found that it gives excellent control of the benomyl tolerant strain. "Afugan" is presently awaiting federal registration before being released to the public.

Using Disposable Plants

Until recent years, most Maryland nurserymen stored their ornamental plants in unheated, plastic-covered greenhouses. During prolonged cold periods, the roots would become severely damaged by cold because indoor temperatures became as cold as the temperatures outside.

Research with microfoam, a styrofoam-like material used extensively in packaging instruments and shipping fine furniture, has proven that most ornamental plants can be overwintered without greenhouse shelter or artificial heat. In late winter or early spring, the plants can be uncovered and spaced for growing or shipping. Such a system is being adapted by many Maryland nurserymen.

Selecting Safe Pesticides

"Cell cultures" have been used extensively in determining the ability of chemicals to cause cancer and in testing other chemicals for their anticancer activity. Agricultural Experiment Station researchers, using human embryonic lung (HEL) cells to test the ability to degrade pesticides, discovered that the HEL cells showed a surprising ability to break down some pesticides while others remained intact. It was shown that the cells used an oxidation process in breaking the chemicals down.

These studies are leading to a better understanding of an animal's ability to degrade pesticides, and which chemicals are degradable. Thus, pesticides can be selected that are highly effective in controlling undesirable insect populations while presenting little hazard to nontarget organisms, including man.

Improving Turfgrass Varieties

Turfgrass research evaluates varieties, weed control programs, fertilizers, mowing height and other management practices. The information generated through the research is being used extensively by sod growers, golf course personnel, homeowners and others interested in growing turfgrass. The research has helped Maryland become the number one producer of sod in the Northeast.

Providing Permanent Pastures

Maryland's agricultural scientists have developed a low cost seeding technique using minimum tillage equipment that reduces soil loss on pastureland too rough for conventional tillage. The technique is known as sod seeding. It improves permanent pastures and appears to have potential for hay crop establishment. Research shows that red clover is the best species for sod seeding. Red clover and trefoil or crown vetch planted in alternate rows, offers the best combination for immediate and long range pasture improvement.

Testing Hay Preservatives

The frequency of rainfall during Maryland's hay season often makes it difficult to produce a high quality crop. Several preservatives, now on the market, can be used so that the hay can be baled at a higher moisture content, and thus reduce the risk of having rain lower the quality of the hay. Researchers found that two preservatives, propionic acid and ammonium isobutyrate, will preserve hay with moisture contents as high as 35 percent.

Soil Survey Completed

Maryland was the third state to complete the detailed soil survey of all its counties. This was made possible through the efforts of field and laboratory studies done by Maryland soil scientists. Soil survey reports have been published for 19 counties in the state thus far. These reports provide information on soil use for farmers, real estate personnel, planning agencies and others.



Fresh strawberry production in Maryland has increased following release of new and improved varieties which are resistant to red stele disease.

New Strawberry Variety Released

The Maryland Agricultural Experiment Station, in cooperation with USDA, released an early maturing high quality, disease resistant strawberry, Earliglow, in 1975. Continued plant breeding research and a strict certification program are reasons why Maryland is a leading strawberry plant producer in the nation. An estimated 30 million virus-free plants are produced annually in Maryland. Over 50 percent of these strawberries were developed in Maryland and are resistant to red stele, a major disease affecting strawberry production. California dominated the wholesale strawberry market during the 1950's. However, with the introduction of more productive and disease resistant varieties, and the advent of retail pick-your-own marketing, the berry industry in Maryland has rebounded until today there are 300 acres in commercial operations.

Testing Herbicides For Growers

Agricultural Experiment Station tests have proven that the herbicide metribuzin is effective in controlling ragweed, jimsonweed and velvet leaf, three weeds that have plagued tomato growers in the state for years. One of the major advantages of using metribuzin, according to Maryland researchers, is that it can be applied after the weeds are growing. This allows the grower to decide whether the application of the herbicide is necessary. If the weed problem in tomatoes can be eliminated, it will greatly improve both hand and mechanical harvesting operations. Environmental Protection Agency registration of metribuzin is expected in 1976.



Landfills produce gases that are harmful to pine seedlings. Researchers at the University of Maryland have developed an inoculum which will protect the seedling roots from damage.

Protecting Pine Seedlings

The practice of planting pine seedlings on newly completed landfills sometimes turns out badly. One cause has been thought to be the generation of several toxic gases by decomposing organic landfill materials.

University of Maryland botanists found that one of these gases, methane, damaged developing roots of Virginia pine seedlings. The scientists found, however, that inoculating the roots of the seedlings with a fungus, *Amanita rubescens*, greatly reduced this damage. The results of this study will hasten the return of landfills to normal use.

Establishing Economic Guidelines

Agricultural scientists are establishing guidelines to determine the economic impact of watershed programs on selected farming communities. They recommend that yield data, land treatment measures, and cultural and technological changes be monitored before and after watershed completion. With this type of data, they hope to calculate the costs and benefits of future watershed programs before a large investment is made.

Registering Vegetable Herbicides

Minor vegetable crops have special weed problems that require herbicides for control. However, due to the low sales volume of herbicides to producers, manufacturers are reluctant to invest in costly federal registration procedures. As a result, the U.S. Department of Agriculture initiated a program in conjunction with universities and industry representatives to implement registration procedures with the Environmental Protection Agency. The Maryland Agricultural Experiment Station has completed research necessary for registration of herbicides to be used on spinach, carrots and asparagus. The application of these herbicides will increase production efficiency as much as 40 percent and will provide more fresh vegetables for the local markets.

New Insecticides Protect Corn

Growing sweet corn in untilled soil offers several conservation and economic advantages, but also encourages attacks by insects. Chemicals for the control of these insects are under close observation by Maryland's agricultural scientists. Research has already developed practical application methods for these insecticides that will not only increase sweet corn yields under dry conditions, but will also reduce the cost of sweet corn production.

Controlling Plant Nematodes

Maryland scientists have made another advance in their battle with plant nematodes, parasitic worms that attack turf, ornamental plants, vegetables and field crops. They have identified the major fatty acid of the nematode. It is called vaccenic acid. Through this discovery, researchers can now study how vaccenic acid is synthesized and the way it acts in the normal metabolism of the parasite. This information will enable them to devise improved means of controlling the nematodes.



By using acetaldehyde vapors in a closed chamber, scientists are able to protect fresh fruits and vegetables from decay.

Reducing Fresh Fruit Losses

Each year, 100 million dollars worth of fresh fruit is lost in transit to local markets. Scientists have discovered that the use of acetaldehyde will markedly reduce losses due to decay and has unlimited potential with fresh fruits and vegetables. Acetaldehyde is a naturally-occurring compound and has been cleared by the Environmental Protection Agency as a food additive and flavoring agent. Studies are continuing with construction and operation of a special acetaldehyde vapor chamber. Pilot tests will be conducted on apples, strawberries and peaches.

Isolating Orchid Viruses

Growing orchids has become a rewarding hobby for many Marylanders and a profitable business for an increasing number of greenhouse operators in the state. Similarly, a growing problem associated with raising these flowers is viruses that affect their growth. Although some viruses are known and controls exist to handle them, two new viruses have been isolated by the Agricultural Experiment Station. The isolation of these new viruses will aid hobbyists and commercial growers in their attempts to keep their plants healthy.

Two new viruses which affect growth of orchids have been isolated by Maryland Agricultural Experiment Station scientists.







SOCIAL SCIENCES & HUMAN ECOLOGY

Analyzing Agricultural Labor

An economic study of agricultural labor shows that mechanization of many of the menial farm tasks has somewhat offset the rising wage rates for most farm workers in Maryland. As mechanization has been adopted, farm employment has declined from a monthly average of 82,000 in 1950 to 32,000 in 1974. Although agricultural economists predict Maryland farm employment figures will experience further decline, the future reduction will be less drastic.

Maximizing Resources: Farmers

Limited resources often restrict farmers' efforts to increase their income. Agricultural economists are working to help these farmers by collecting and studying field and census data to determine costs, returns and the best use of available resources. Current field work is being done on the Eastern Shore. Once the data are in, the scientists will use a linear programming model to select enterprises or combinations of enterprises that will provide maximum net income for the limited resource farmers.

Testing For Sickle Cell Anemia

Sickle cell anemia, a disease of the red blood cells, continues to claim thousands of lives each year, mainly among the black population. Agricultural Experiment Station scientists are trying to pinpoint the causes of the disease. Working under the hypothesis that the trace minerals in the diet — copper, zinc and molybdenum — have a direct relationship to sickle cell anemia, the scientists are testing blood and urine samples of sickle cell anemia patients and healthy subjects for the presence of these metals.

Enzymes that affect copper levels in the blood stream are also under study, and plans for evaluating oral zinc sulfate treatments in sickle cell patients have been proposed. The objective of these experiments is to normalize the trace minerals, restore normal enzyme activity and increase the half life of blood cells of persons with sickle cell anemia.

Meeting Community Needs

Rural areas usually lack some of the educational, health, recreational and other community services found in urban areas. To determine to what degree Maryland's rural citizens were receiving such services, University of Maryland scientists interviewed 250 rural families in Frederick County. This information on the distribution of community services has been provided to agency directors, government officials and citizens for use in planning future rural area services.



Maryland citizens could save as much as 12 to 19 percent on their prescription drug bills by comparison shopping, according to research studies.

Reducing Drug Bills

Consumers can reduce their prescription drug bills by as much as 12 to 19 percent through comparison shopping. That is the conclusion of a University of Maryland researcher who conducted drug price surveys in two market areas of the state.

Price data were obtained for two sample types of prescription drugs. One sample represented drugs used by the elderly, and the other represented drugs used by the general public. Wide variations in drug prices exist from store to store. Overall, there was a 12 percent savings potential for drugs bought by the elderly. Computed on a statewide basis, this would represent a potential savings of 131 million dollars. The corresponding figures for drugs used by the general public are even more staggering. They were 19 percent and 907 million dollars, respectively.

The survey also pointed out the need for price advertising to increase consumer awareness of the potential gains offered by comparison shopping. Increased competition created by price advertising would reduce consumer spending on prescription drugs.

Establishing Bacterial Standards

Most food scientists agree that standards for bacterial levels in fresh meats are forthcoming. Such standards were proposed for Maryland last year. Thus, the need for additional bacteriological data on fresh meats became apparent, and University of Maryland scientists went to work to determine possible quality standards needed in the state. Typical bacteria counts on ground beef are being determined. Research is also directed to changing current analytical procedures and developing new ones. Frozen and refrigerated shelf-life studies are also being conducted to determine what effect storage will have on quality.

Standardizing Agricultural Tests

Maryland's agricultural educators are following the footsteps of other educators in developing standardized tests for classroom use. Such tests help teachers evaluate the different teaching methods they use; measure student knowledge in comparison with those from other schools; plan teaching programs; and help in self evaluation. So far, researchers have developed tests for crops and soil science and ornamental horticulture for high school students. They have also developed a standardized test for adults interested in becoming pesticide applicators. The latter test is being used nationwide.

Agricultural scientists are standardizing many of the tests used by high school students in order to better evaluate student performance.

Obesity in School Children

Research has detected little relationship between the number of calories children consume and their tendency to gain weight. This conclusion was based on a study of the diets of 22 obese and 22 normal weight children, ages 9 through 11. Further findings show that although obese children spend more of their time in physical activities, they are probably less active and expend less energy than normal weight children doing the same tasks. The studies are continuing in an effort to gain more conclusive information on the causes of obesity in children.

Assessing Tax Programs

Alternative tax programs for Maryland forestland owners are under evaluation by University of Maryland researchers. Reviews of Maryland's present tax laws revealed insufficient economic incentives to encourage Maryland forestland owners to participate in the Maryland Forest Conservation Program. The present law allows forestland owners to have their tax assessments frozen by following conservation practices outlined by the Department of Forests. Most landowners have not taken part in the program because compliance with the conservation practices costs them more than they can save from the frozen tax assessments. In any case, tax assessments on forestlands in Maryland remain fairly constant. Under the proposals being considered, forestland owners would have more economic incentive to comply.



Milk Tolerances in Students

Studies at the University of Maryland show that there is no significant relationship between vitamin B₂ deficiencies in white high school students and their intolerance for milk and milk products (milk sugars). However, researchers are not sure their findings will hold true for blacks of the same age group. Previous studies have revealed a high percentage of black students with vitamin B₂ deficiencies. Further studies are needed to see if the findings of the white student experiments will hold true with black students.

Forest Visitor Studies

A project aimed at helping state forest managers maintain and upgrade the quality of state forest resources and increase visitor satisfaction has just been completed by the Maryland Agricultural Experiment Station.

Scientists gathered detailed data of visitor activities in the Savage River State Forest, including forest areas used, length of stay and size of group. This information has been compiled in an atlas to aid forest managers in their planning procedures.

The scientists obtained the views of visitors on resources and facility quality, appropriateness of management practices and their personal enjoyment of the forest facilities. The information will be used by the managers to change management practices in order to better meet the needs of state forest visitors.



Tests show that middle income children spend much of their lunch money on high energy foods which contain extra calories and cause high obesity rates.

Benefits Of School Lunches

Although lower income students benefit from lunches provided by school systems, middle income parents might be better off packing their children's lunches. Research shows that middle income children who brought their lunches consumed 580 less calories than those who bought their lunches at the school. Those middle income students who bought their lunches also had a higher rate of obesity.





ANIMAL & AVIAN AGRICULTURE

Improving The Milk Supply

Dairy scientists are working with the hormone prostaglandin to help herd managers increase the conception rates of their cows. To make sure that none of the hormone finds its way into the milk supply, researchers have devised a highly sensitive measurement system to detect any contaminants present in the milk of the cows injected with prostaglandin. The system is presently undergoing tests and evaluations.

Extensive Live Cattle Measurements

Cattlemen with a trained eye for selecting beef animals that will yield the best lean carcasses should pay most attention to the shoulder area. New research results, based on comparisons of extensive live cattle measurements and carcass, show that shoulder area measurements are more predictive than those in the area of loin and round.

Using Corn Stalks

A large portion of the energy stored by the corn plant is found in the stalk. When corn is harvested for grain, the stalks are often left in the fields as waste products. Research is being conducted to determine the best way of using corn stalks in a modern dairy operation. Work completed during the past year indicates that stalks can be substituted for at least half the hay fed to replacement animals. Future uses could lead to a reduced cost of milk production.

Regulating Calving Intervals

Dairy and beef cattle operators suffer major economic losses when cows fail to calve at regular intervals. In order to calve each year, cows must return to their reproductive functions for rebreeding soon after calving. The Agricultural Experiment Station is working with various reproductive hormones in order to establish fertility in cows no later than 40 days after calving. Scientists have had limited success so far, but further experiments should refine the procedures used and determine the proper hormone doses.

In a related study with young dairy calves, researchers have discovered that the glandular mechanisms which regulate reproduction are present in cattle almost from the time of birth. Studies are now focusing on the changing sensitivity of these mechanisms that eventually leads to normal reproduction activity at puberty. Knowledge from this study will aid scientists in initiating reproductive activity after calving and may be of use in getting heifers to reproduce earlier.

Improving The Field Situation

Studies of condemnation rates in Maryland's broiler industry revealed that the level for Maryland broiler plants was higher than their competition. Broiler producers then began taking a closer look at the causes of the higher condemnations and developed steps to alleviate the causes. As a result, condemnation rates dropped, and the savings from the measures increased revenues nearly 789 thousand dollars in Maryland plants in 1974. Further research on management practices used in Delmarva broiler plants are helping this region remain competitive with other broiler producing regions.



Most consumers are unable to distinguish between sterilized milk produced by University of Maryland dairy scientists and normal pasteurized milk.

Producing Sterile Milk

For many years, dairy scientists have been searching for a process that will produce sterile fluid milk with an acceptable flavor. University of Maryland researchers are currently studying a process that allows milk to free-fall in thin films in a pressurized steam atmosphere, followed by a short period in a holding tube and a rapid cooling vacuum treatment. Their studies have verified the process in terms of product sterility, enzyme inactivation and consumer acceptance. Both commercial milk processors and consumers have found the processed milk to have excellent flavor and quality. The normal shelf life of the product is significantly increased by the process with proper packaging. Additional investigations will determine what effect, if any, the process has on vitamin and protein content.



Nasal swabs taken from cattle have helped in isolating respiratory viruses affecting cattle.

Controlling Respiratory Illness

There is an old cliché that says it takes a thief to catch a thief. Well, agricultural scientists at the University of Maryland think that one virus may be used to control another virus that causes serious respiratory infection and decreased growth in cattle. The culprit in this case is known as type 2 adenovirus. The virus that the scientists feel may be used as a control is a bovine adeno-associated virus (AAV). The AAV seems to grow at the expense of the adenovirus. These findings could lead to a solution for a problem that has plagued cattlemen for years.

Reducing "Eggflation"

Research is doing its bit to avoid "eggflation" by helping Maryland's egg producers reduce their losses due to cracked and broken shells. Currently these losses are estimated at six to seven percent, amounting to about 160 million dollars annually.

Most of the breakage is the result of poor eggshell quality. Scientists have partially overcome the problem through the possible use of a metabolic form of Vitamin D₃ in the diet of hens, which in their experiments, increased both eggshell density and thickness. The increased calcium content in these eggshells markedly reduced damage during normal handling procedures.

Developing Swine Rations

Animal scientists have demonstrated that grass and legume forages can be successfully included in the rations of mature breeding swine. Although young pigs have a limited capability for digesting forages, research shows that mature swine can handle maintenance diets containing as much as 40 to 60 percent ground hay. Highest digestibility was achieved with a ration containing 40 percent Coastal Bermuda grass. Feeding forage to mature swine could be particularly advantageous during periods when grains are in short supply or high in cost.



Blood samples taken from broilers aid scientists in finding serums to control viruses in commercial broiler operations.

Viruses Control in Broiler Flocks

The scientific identification of the strain of Infectious Bronchitis virus responsible for vaccine breaks in Maryland broiler flocks has resulted in a change in vaccination practices. Since the new vaccinating procedure has been implemented, the disease appears to be under control. The incidence of the disease has dropped from 250 cases per 10,000 birds in 1971 to 50 per 10,000 in 1975. This amounts to a net savings of nearly 5.6 million dollars for Maryland's broiler industry. The new procedures were a significant factor in these increased savings.



Early weaning of pigs by top swine managers can make better use of sows and production facilities.

Early Weaning of Pigs

Maryland swine producers can make the best use of their sows and their production facilities by weaning pigs as early as possible. Research by animal scientists shows that this might be as early as seven days of age for highly skilled producers who can meet exacting dietary and environmental requirements. The scientists reared pigs weaned at seven days to weights of 40 pounds with a fairly simple diet of corn, soybean meal, dried skim milk and fish meal, fortified with vitamins and minerals. Feed was mixed with water to get the young pigs started on the diet.

Preventing Feed Spoilage

Maryland feeding studies with sheep show that the use of propionic acid to prevent spoilage of high moisture alfalfa and corn also increases animal appetites and nutrient digestibility. Even more impressive is the effectiveness of propionic acid in preventing a temperature rise in stored feeds. As a result, 20 to 25 percent more dry matter is preserved in treated as compared with untreated feeds.

Synchronizing Cattle Breeding

The use of hormone compounds to synchronize the breeding season in artificially-bred beef cattle can reduce animal fertility by 25 to 40 percent. University of Maryland scientists have demonstrated that treatment with progestins disrupts the normal function of the cow's ovaries. These research results indicate that although hormonal treatments can greatly reduce labor needs, the gains are seriously offset by a smaller calf crop. Research will be directed to find other ways of achieving labor efficiency in the artificial insemination of beef cattle.

Pinpointing Bacteria in Milk

The firefly may speed up the means of determining the number of bacteria in milk. Research by the Maryland Agricultural Experiment Station shows that one of the compounds causing fireflies to emit light, adenosine triphosphate (ATP), can be measured using different light intensities. Bacteria contain a very constant level of ATP. If the amount of ATP in a solution can be measured, the number of bacteria cells present can be estimated. The whole procedure would take only 20 minutes. Current methods require 48 hours.

Research Shows Poultry Processors Can

The process of preparing broilers for market has historically resulted in the removal of the outer skin layer, which also removes the desirable yellow color. Poultry scientists have found methods and procedures that enable processors to maintain the natural skin color of the bird during processing. This allows Maryland processors to market a product that other broiler-producing areas in the nation find uneconomical to produce, providing them a competitive edge, particularly in the Northeast.

Improving Poultry Feeding

Another way that research is helping to keep Maryland's broiler producers competitive is through the continuing testing and improvement of broiler rations. Through ongoing nutritional studies, poultry scientists have developed nutrient specifications for efficient broiler growth. Birds used in a 1975 experiment gained a pound for every 1.95 pounds of feed, and weighed 4.80 pounds at 8.5 weeks of age on a commercial type feeding program. The scientists feel that even these excellent results can be improved upon, suggesting a bright outlook for Maryland's broiler industry.



An artificial rumen, built for the laboratory, simulates digestion which takes place in normal rumens of cattle.

Supplement Nitrogen in Cattle Diets

Nonprotein nitrogen (NPN) sources such as urea are important to dairy farmers when natural protein sources are too costly or are needed for other purposes. Agricultural scientists are trying to learn how NPN sources are used by cattle. Results indicate that urea can supply nitrogen in diets containing high levels of crude protein and with the necessary starches for digestion in the rumen.

Measuring Foal Growth

The growth of foals is not significantly affected by either weaning age or by feeding a milk replacer to their mothers. Although animal scientists detected growth differences for short intervals due to the manipulation of weaning age and mare's diets, no differences were apparent by the time the foals were a year old.

Using Processing By-products

Over five billion pounds of cottage cheese whey, a normal waste product in the manufacture of cottage cheese, are produced each year. Maryland scientists have developed several new products using whey. These include sherbet and ice cream, fruit drinks, cocktail mixers, jellies and jams, alcoholic beverages and salad dressing bases. Various food processing companies are interested in commercially-producing many of the newly developed products.

Capturing The Sun's Energy

The Agricultural Experiment Station is accepting the challenge of harnessing solar energy for use in broiler houses in three ways: economics, production and engineering design, and construction. Although the project is in its initial stages, the final information recovered should have far-reaching effects on energy use in agriculture. If solar energy can be partially substituted for heating systems now being used in Maryland broiler houses, 90 million gallons or 26 million dollars worth of propane gas could be saved. In addition, the ideas developed in broiler houses could be transferred to other agricultural enterprises such as greenhouses, hog houses and grain drying operations.

Isolating Virus Vaccines

Researchers isolated two new horse viruses while trying to confirm the cause and develop an immunity for Equine Rhino-pneumonitis and Equine Virus Abortion, two of the most costly diseases affecting Maryland horses. These discoveries have further complicated research efforts, but experiments are continuing in order to find a vaccine that will safely immunize horses against these diseases.

Determining Virus Sources

Where do viruses in cattle come from? A team of Maryland scientists may have found the answer to that question. This year, a herd of "healthy" cattle was studied to determine if any viruses were present in the herd. A total of 18 viruses was isolated. Since there are only 21 known cattle viruses, the scientists concluded that viruses are always present but disease from viruses occurs only when the animal is under stress.

Changing Industry Alignments

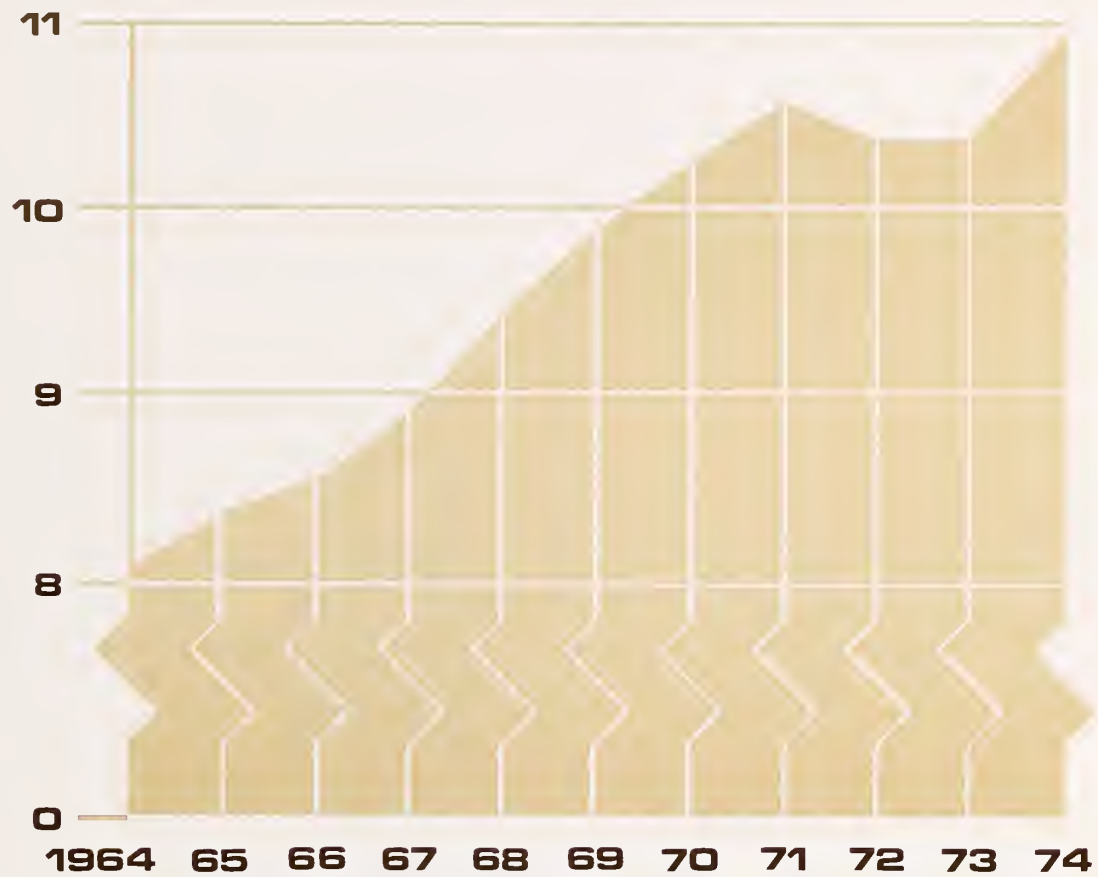
The artificial breeding (AI) industry is an important tool of dairy and beef cattlemen in Maryland and the U.S. AI will undergo some realignments and restructuring in the next 10 years according to a study just released by Maryland's Agricultural Experiment Station. Mergers and consolidations will force these changes. The study concludes that these changes will facilitate efforts to keep costs of services at a low level.

Repelling Cattle Viruses

Agricultural Experiment Station studies show similarities in the bovine respiratory syncytial virus (RS) and the human RS virus, which causes early childhood respiratory infections. In humans, antibodies used to control the virus can be taken from the blood, but antibodies in cattle blood have little effect on the virus. However, scientists discovered the antibodies taken from the nasal secretion of cattle staved off further attacks from the virus.

thousand
lbs.

Annual Milk Production Per Cow in Maryland







ENVIRONMENTAL & PRODUCTION SYSTEMS

A swine waste management system that requires minimum labor and energy to operate, and yet eliminates potential water pollution hazards, has resulted from animal science research. This new superior system, featuring a two stage lagoon, is the culmination of 10 years of research during which the scientists evaluated several alternative waste management methods, including settling tanks, septic disposal fields, and the transfer of excess lagoon liquids to grasslands by spray irrigation.

Controlling Poultry Plant Effluents

The proximity of Eastern Shore poultry processors and hatcheries to recreational and shellfish water has made it imperative that the discharge from these plants does not contaminate the natural water resources. A study to determine the characteristics of hatchery effluents by the Maryland Agricultural Experiment Station has provided information from which hatcheries can design modern waste water treatment facilities. In addition, research dealing with killing and defeathering in processing plants has provided management methods and equipment layouts that will lower the quantity of blood, thus reducing the amount of organic matter in the final effluent that must be treated.

Harvesting Maryland Tobacco

Experiments are underway on a mechanical harvesting system for Maryland tobacco. The system's biggest potential is for the elimination of handstripping the tobacco. A machine for cutting and loading tobacco onto wagons is already being used by Maryland farmers. Curing chambers have also been designed that will aid farmers during periods of high humidity. High humidity causes heavy losses of tobacco when the tobacco is conventionally cured. The low-temperature chambers developed by the researchers will take care of this problem. The whole system will greatly reduce Maryland farmers' dependency on hand labor.

Eliminating Labor Problems

The Agricultural Experiment Station is continuing its work to develop a machine that will eliminate the hand shucking of oysters. Shucking accounts for 70 to 80 percent of the labor required in oyster processing plants, and the industry is having a hard time attracting new workers. A machine designed by agricultural engineers is in the developmental stages. The researchers are now working on the individual components of the machine to increase the efficiency of operation.



Much of the machinery used in broiler plants creates noise. Through studies conducted by University of Maryland researchers, noise can be kept at a safe level for workers.

Holding Down The Noise

Research has made it possible for all poultry processing plants in Maryland to meet the federal government's safe noise level standards. Surveys and studies in processing plants led to recommendations for reducing noise to safe levels. The Occupational Safety and Health Administration (OSHA) had previously determined that noise above these levels was a health hazard to plant employees and that prolonged exposure would result in permanent hearing losses.

Howling Effects On Broilers

Evaporatively-cooled housing in broiler production has a distinct advantage over windowless and conventionally-cooled housing when the outside temperature reaches 90° F. or more. Agricultural scientists found that feed conversion rates were better and mortality losses lower in the evaporatively-cooled broiler houses. Weight gain was the same in evaporatively-cooled housing and windowless housing. Conventionally housed birds were about 0.10 pounds lighter.

Studying Waste Disposal Effects On Soil

Sludge disposal can present hazards to crops and the environment. A soil testing program has been established at the University of Maryland to determine the amount of sludge to apply on soils so that risk from using sludge will be at a minimum. The soil testing program is a direct result of previous experiments on heavy metals, nitrates and crop responses to sludge applications.

Food and Harmony

The various industries engaged in producing food and fiber are all interrelated. For example, Maryland's broiler industry has a positive influence on farmers who produce corn and soybeans in Maryland. On the other hand, wastes from broiler operations may threaten the oyster industry of the Chesapeake Bay. Scientists are busy trying to eliminate the waste problems; thus allowing both industries to prosper. The scientists are examining possible waste handling systems that are designed to protect the environment and yet not be prohibitive to the poultry industry.

Disposing of Dairy Wastes

Like poultry processors, Maryland dairymen are also faced with the problem of disposing of wastes without creating a negative impact on the environment. Dairymen in the Monocacy River Watershed area tested six methods of manure handling to find the one best suited for them. Labor, investment and annual costs were developed by agricultural scientists for 50, 100 and 200 cow size operations. This gave the farmers a clearer evaluation of the systems of disposal they were using.

Monitoring Groundwater Quality

Agricultural scientists are monitoring groundwater quality to see how it is affected by high amounts of liquid swine waste. One test conducted on Comus silt loam soils showed that organics and nutrients filtered into the groundwater and contaminated the supply. Further investigations on natural soils, constructed soil beds, and other soil structures are necessary to design a waste handling system that will not affect groundwater quality.

Cutting Fuel Costs

The Agricultural Experiment Station has found one way broiler producers can cut back on their fuel expenses: by lowering the starting temperature of broilers to 85° F. and then reducing the temperature five degrees per week until the temperature reaches 70° F. Scientists discovered that fuel costs were reduced and that the lower temperature showed no significant difference in bird mortality or feed conversion. Birds started at 85° F. also had the lowest fat content. Researchers conclude that the 85° F. starting temperature is the best practice for broilers grown in windowless houses.



ADMINISTRATION

FINANCIAL STATEMENT 1973-1975 SOURCE OF INCOME

General	
Hatch (requires matching funds above \$90,000)	\$ 799,172
McIntire-Stennis (requires matching funds)	84,972
Hatch RRF	<u>274,894</u>
	1,159,038
State Appropriation	<u>2,933,366</u>
Total	\$4,092,404

EXPENDITURES BY MAJOR RESEARCH AREAS*

Animal, Avian Agriculture	\$1,636,961
Plant Sciences and Soil	1,636,961
Environmental and Production Systems	286,468
Social Sciences and Human Ecology	490,240
Administration	<u>122,774</u>
Total**	\$4,092,404

*Approximate figures, final FY 75 financial data incomplete.

**Expenditures include \$3,230,619 for salaries and \$861,785 in operating expenses.

Percent of Expenditures by Major Research Areas

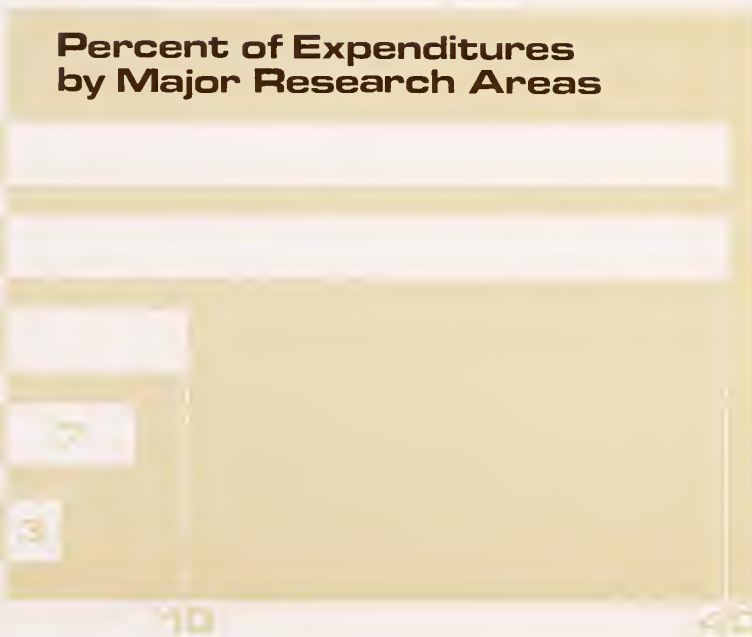
Animal and Avian Agriculture

Plant Sciences including
Soils and Pest Management

Social Sciences and Human Ecology

Environmental and Production Systems

Administration





MARYLAND'S RESEARCH FARMS



1. Maryland Agricultural Experiment Station. Headquarters 1326 Symons Hall. Established 1888. Research work in all phases of agriculture and related fields.
2. Plant Research Farm (Montgomery County). Research on turfgrass, insects, truck crops and small fruit. 320 acres.
3. Agronomy-Dairy Forage Farm (Howard County). Studies of dairy nutrition and management, forage production, swine nutrition and management and pollution abatement practices. 926 acres.
4. Horse Research Center (Howard County). Experiments studying physiology, nutrition and management of horses. 160 acres.
5. Beef Research Center (Carroll County). Research concerning livestock production and management. 720 acres.
6. Tobacco Research Farm (Prince George's County). Research relating to tobacco breeding, production, harvesting and curing. 206 acres.
7. Wye Institute (Queen Anne's County). Work on plant breeding, weed and disease control, and production systems for corn, soybeans, vegetables and ornamentals. 125 acres.
8. Salisbury Research Substation (Wicomico County). Experimental studies dealing with poultry and breeding, insect, pest and disease control, production systems and management and processing of vegetable crops. 89 acres.
9. Poplar Hill Research Farm (Wicomico County). Studies of disease control, breeding, pest control and production systems for corn, soybeans and vegetable crops. 100 acres.
10. Fruit Research Center (Washington County). Research on fruit production, disease control and fruit insects. 28 acres (leased).

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